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ABSTRACT

Within the last five years there has been a great deal of change in the role of technology in the schools. The advent of microcomputers has had an impact on instructional techniques as has the development of interactive graphics and animation, and other technologies such as videodisc and micronet. Teacher educators face the responsibility of preparing teachers to teach students who will be living and working in the computer age. There are three major issues that teacher educators must consider in addressing the effect of computers on curriculum and instruction. First, educators should consider ways that the proliferation of computers and the growth of computer-related technologies can and should affect the content of curriculum and instruction. A second issue to be considered is how the availability of computers in schools can and should affect the quality of appropriate content. The implications of the computer age for teacher education comprise the third issue. The Technology and Basic Skills Project - Mathematics at Ohio State University addresses all three issues as they are related to the teaching of mathematical concepts and problem solving skills to middle grade students. The program's principles and techniques are generalizable to other grades and to other subject areas. A primary principle of the program is that computers should be viewed by both the student and the teacher as a tool with multiple uses, including record keeping, data collecting, altering the content and quality of instruction, and problem solving. Effective use of computers can afford learners the opportunity to experiment with and control the cognitive environment in which they are working and learning. Teacher educators must begin to prepare teachers for the computer age and must focus on the very best this technology can offer to education. (JD)

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Technology in the Classroom: Initiative or Response?
New Directions in Curriculum Development

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The question posed in the title of this session "Technology in the Classroom: Initiative or Response?" might better be posed in more detail as a modified statement and a pair of questions:

Technology is increasingly in the classroom!

Who will seize the initiative?

What will be the response?

I would like to argue first that the statement is definitely true: technology is increasingly evident in our classrooms, and this trend will and should continue. Secondly, someone will seize the initiative; and for the moment, at least, it had better be us ... the teacher educators whose responsibility it is both to nurture in teachers the flexibility to seize opportunities as they arise and to alert them to the opportunities that are either available or imminent.

As for the response, to whatever initiatives are taken, several scenarios are available. Let it be remembered that computers were first invented to perform dull and laborious tasks that human beings, in general, would rather not do. It is possible to use computers in schools to direct students in their performance of just this type of work. On the other hand recent developments in computer related technologies offer an overwhelming array of tools

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for use in new instructional approaches to many topics. And, indeed, the very existence and proliferation of computers is changing our world, both from the point of view of the "career educator" who wishes to prepare students for a role in the "world of work," and from the point of view of the "liberal educator" who seeks to provide students with a core of general knowledge and a cache of problem solving tools.

Computers in the Schools

Computers have had a role in instruction for some years. Drill and practice programs, often thought of as automated flash cards have been in use since the first "teaching machine' built by Sidney Pressey in the 1920s. Various fields in the physical and behavioral sciences have developed and long used computer simulations of numerous situations and experiments for instruction, primarily at high school and collegiate levels. Programs for the individualization of instruction have used computers extensively for diagnostic, prescriptive, and record-keeping procedures. Seymour Papert (and others) have been constructing computer-based environments in which to teach children in new ways to construct their own knowledge and systems of operations. All these educational implementations of computer technology have been with us 10, 15, 20 and in some cases, 25 years. If they have had an impact to date it has been a minor one, at least as measured by the number of children affected, the number of teachers affected, or the need for Colleges of Teacher Education to be deeply concerned.

Within the last five years, however, there has been a great deal of change in the role of technology in the schools. The initiative for this change is derived, in large part, from hardware developments in the technologies available to, and being used by, the schools. The advent of microcomputers, followed by their decreasing price (and hence, their availability

to the schools) has had an enormous affect, as has the development of interactive graphics and animation, and as will the other technologies such as videodisc and micronet described in other sections of this meeting.

Several processes are contributing to a rapidly changing situation with respect to the use of computers in schools. As the cost of microcomputers decreases, the demand from parents, teachers, administrators, and children for their use is growing. Increasing numbers of teachers are gaining rudimentary competence in computer operation as well as in use of the BASIC programming language or some other computer authoring system. Traditional textbook publishers are producing and marketing computer software (some quite good and some very bad) to accompany their text series. New software companies are producing and marketing "educational software;" often this material is produced by youthful programmers with no educational training or intuition, whatsoever.

All these forces coupled with the same natural appeal of computers that has made video-games a billion dollar industry, are creating a situation in which future and current classroom teachers need our help. The remainder of this paper will address our optimal iniative and response with respect to this need as it affects curriculum and instruction.

Three Major Questions

There are three major questions to consider in addressing the effect of computers on curriculum and instruction:

First, how can and should the proliferation of computers and the growth of computer related technologies affect the content of curriculum and instruction? Secondly, how can and should the availability of computers in schools affect the quality of appropriate content? Finally, what are the implications for teacher education. These questions, and their answers, are, of course,

inseparable from each other in practice; however, it is important that we remember to focus on each of them regularly, for to consider one at the expense of the others would be to lose sight of important aspects of the problem.

The Technology and Basic Skills Project - Mathematics (TABS-Math)[1] at The Ohio State University addresses all three of these issues as they are related to the teaching of mathematical concepts and problem solving skills to children in the middle grades. Many of the principles and techniques we use in addressing these issues are generalizable to other grades and to other subject matter areas. Primary among these principles is one related to the content of instruction: the computer should be viewed by both the student and the teacher as a tool with a multitude of uses.

One of these uses is, of course, record-keeping, through the computerizing of grade books and of associated data collecting and combining and reporting activities. This use can be adapted almost directly from business applications of computers. While it is certainly of interest and value to teachers it is to my mind the least interesting and least challenging of the potential applications of computers in the schools. The unique contribution of computers to the school lies in how they can and will affect the content and quality of instruction.

In this domain, the potential for computer use is just beginning to be apparent. As society uses computers for increasing numbers of tasks the role of computer literacy in education looms increasingly important. The very nature of basic skills for functioning in society is changing almost daily and will soon demand that the minimally educated child be familiar with

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[1]This project is funded by The U.S. Department of Education, Office of Libraries and Learning Technologies, Division of Educational Technology, Contract No. 300-80-0784.

keypads, printout, wordprocessing and data bases. The higher order skills demanded will likely include programming for the purposes of problem solving. Thus, just as the content and goals of instruction have changed in the past in accommodation to changes in society, they are likely to change to meet the demand of our increasingly technological culture.

At a deeper level the content of instruction is likely to reflect the availability of the computer as a new instructional tool. Here the technological potential is great, for it allows us to animate textbook pages, to provide children with repeated and diverse experiences with concepts and principles and through simulations to involve children in ongoing problem solving experiences.

In a very real sense, the computer used well can afford learners the opportunity to experiment with and control the cognitive environment in which they are working and learning. Phrases like hypothesis testing, manipulation of variables, and construction of concepts all take on a new meaning in a learning environment where children can individually call for operations and examine their effects.

What does this mean for teacher education? The implications for the training of both inservice and preservice teachers are many and are the subject of other speakers at this meeting. From my own perspective we must begin the task of preparing teachers for the computer age yesterday and must focus on the very best of what technology can offer to education - freedom for the teacher and student alike to pursue the ideal of an educated society.